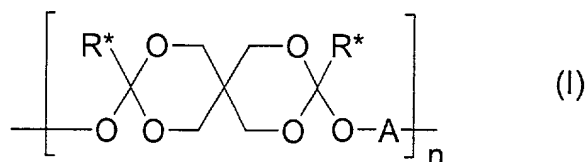


WHAT IS CLAIMED IS:

1. A polyorthoester of formula I:

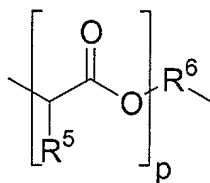


where:

- 5 R* is a C₁₋₄ alkyl;
n is an integer of at least 5; and

A is R¹, R², R³, or R⁴, where

R¹ is:

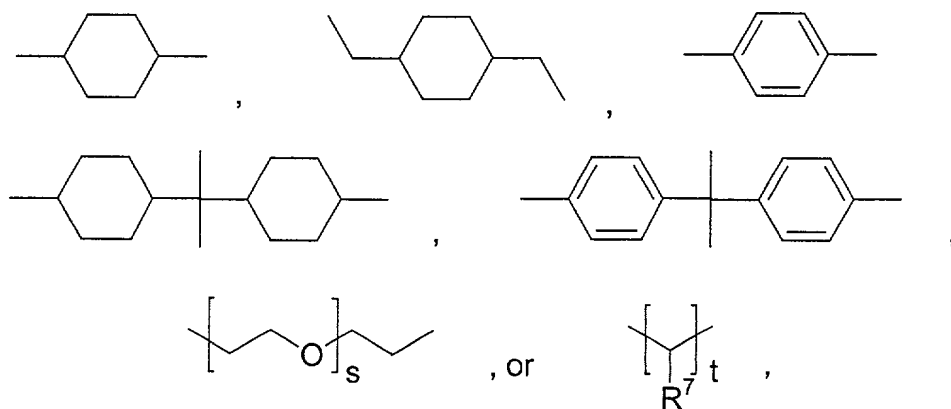


- 10 where:

p is an integer of 1 to 20;

R⁵ is hydrogen or C₁₋₄ alkyl; and

R⁶ is:



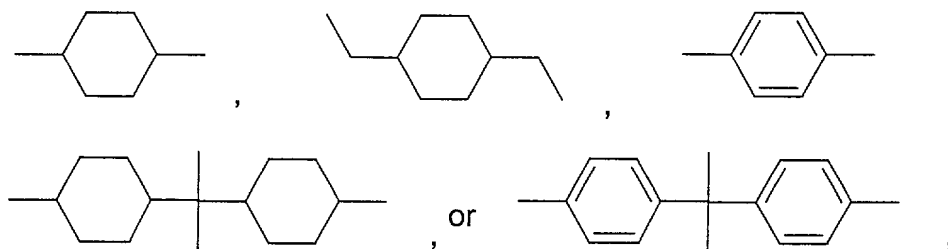
- 15 where:

s is an integer of 0 to 30;

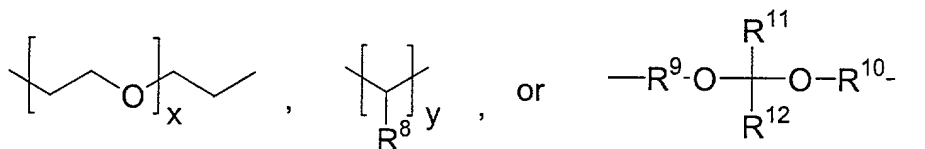
t is an integer of 2 to 200; and

R⁷ is hydrogen or C₁₋₄ alkyl;

R² is:



5 R³ is:



where:

x is an integer of 0 to 30;

y is an integer of 2 to 200;

10 R⁸ is hydrogen or C₁₋₄ alkyl;

R⁹ and R¹⁰ are independently C₁₋₁₂ alkylene;

R¹¹ is hydrogen or C₁₋₆ alkyl and R¹² is C₁₋₆ alkyl; or R¹¹ and R¹² together are C₃₋₁₀ alkylene; and

R⁴ is a diol containing at least one functional group independently selected from amide, imide, urea, and urethane groups;

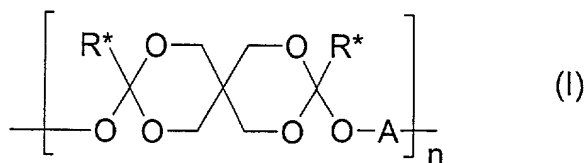
15 in which at least 0.1 mol% of the A units are R¹, and at least 0.1 mol% of the A units are R⁴.

2. The polyorthoester of Claim 1 where n is about 5 to about 1000.

3. The polyorthoester of Claim 2 where n is about 20 to about 500.

4. The polyorthoester of Claim 3 where n is about 30 to about 300.

5. The polyorthoester of Claim 1 which comprises about 1 to about 50 mole percent of units in which A is $-O-R^1-$.
6. The polyorthoester of Claim 5 which comprises about 2 to about 30 mole percent of units in which A is $-O-R^1-$.
- 5 7. The polyorthoester of Claim 6 which comprises about 5 to about 30 mole percent of units in which A is $-O-R^1-$.
8. The polyorthoester of Claim 7 which comprises about 10 to about 30 mole percent of units in which A is $-O-R^1-$.
9. The polyorthoester of Claim 1 where p is 1 to 6.
- 10 10. The polyorthoester of Claim 9 where p is 1 to 4.
11. The polyorthoester of Claim 10 where p is 1 to 2.
12. The polyorthoester of Claim 1 where R^4 is hydrogen or methyl.
13. The polyorthoester of Claim 1 which comprises up to about 20 mole percent of units in which A is $-O-R^2-$.
- 15 14. The polyorthoester of Claim 1 which comprises about 60 to about 99.9 mole percent of units in which A is $-O-R^2-$.
15. The polyorthoester of Claim 1 where q is 1 to 6.
16. The polyorthoester of Claim 15 where q is 1 to 3.
17. A process of preparing a polyorthoester of formula I:



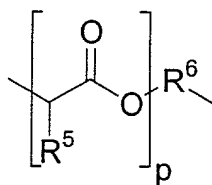
where:

R* is a C₁₋₄ alkyl;

n is an integer of at least 5; and

5 A is R¹, R², R³, or R⁴, where

R¹ is:

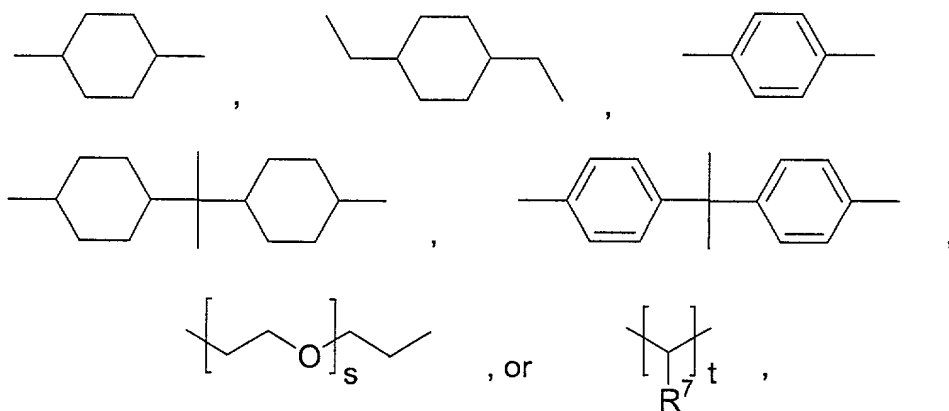


where:

p is an integer of 1 to 20;

10 R⁵ is hydrogen or C₁₋₄ alkyl; and

R⁶ is:



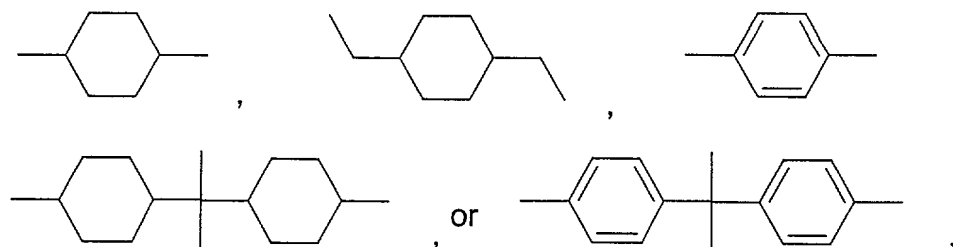
where:

s is an integer of 0 to 30;

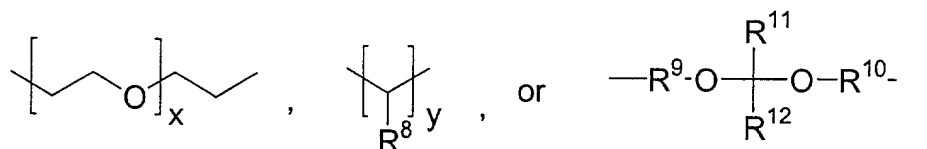
15 t is an integer of 2 to 200; and

R⁷ is hydrogen or C₁₋₄ alkyl;

R² is:



R^3 is:



where:

5 x is an integer of 0 to 30;

y is an integer of 2 to 200;

R^8 is hydrogen or C_{1-4} alkyl;

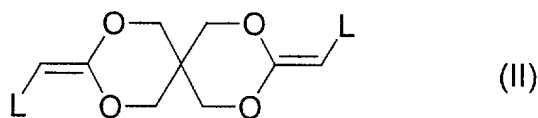
R^9 and R^{10} are independently C_{1-12} alkylene;

R^{11} is hydrogen or C_{1-6} alkyl and R^{12} is C_{1-6} alkyl; or R^{11} and R^{12} together are C_{3-10} alkylene; and

10 R^4 is a diol containing at least one functional group independently selected from amide, imide, urea, and urethane groups;

in which at least 0.1 mol% of the A units are R^1 , and at least 0.1 mol% of the A units are R^4 ,

the process comprising reacting a diketene acetal of formula II:

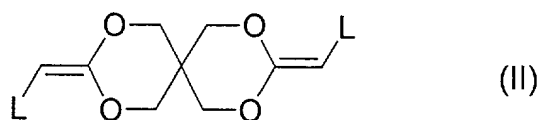


15 where L is hydrogen or a C_{1-3} alkyl,

with a diol of the formula $HO-R^1-OH$ and a diol of the formula $HO-R^4-OH$, and optionally at least one diol of the formulae $HO-R^2-OH$ and $HO-R^3-OH$.

18. A polyorthoester that is the product of a reaction between:

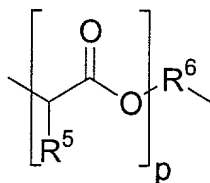
20 (a) a diketene acetal of formula II:



where L is hydrogen or a C₁₋₃ alkyl, and

(b) a polyol or mixture of polyols in which at least 0.1 mole percent of the total polyol content is a diol of the formula HO-R¹-OH, where

5 R¹ is:

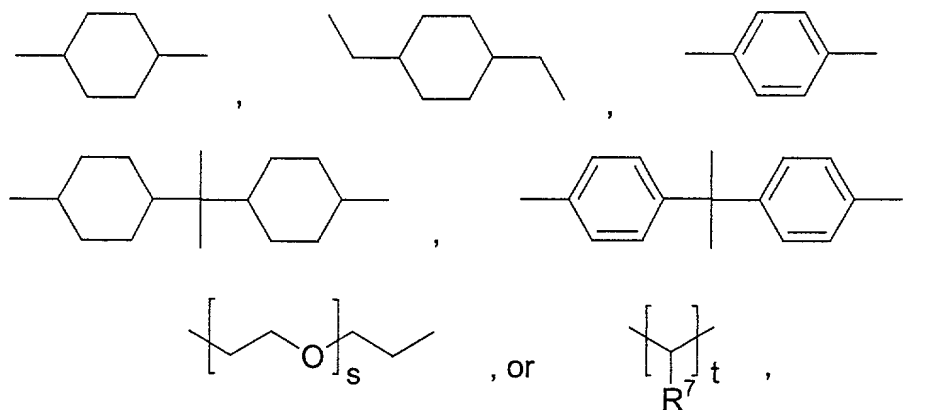


where:

p is an integer of 1 to 20;

R⁵ is hydrogen or C₁₋₄ alkyl; and

10 R⁶ is:



where:

s is an integer of 0 to 30;

t is an integer of 2 to 200; and

15 R⁷ is hydrogen or C₁₋₄ alkyl;

R¹¹ is hydrogen or C₁₋₆ alkyl and R¹² is C₁₋₆ alkyl; or R¹¹ and R¹² together are C₃₋₁₀ alkylene; and

at least 0.1 mole percent of the total polyol content is a diol of the formula $\text{HO-R}^4\text{-OH}$, where R^4 is the residue of a diol containing at least one functional group independently selected from amide, imide, urea, and urethane groups.

5 19. The polyorthoester of Claim 18 where at least one of the polyols is a polyol having more than two hydroxy functional groups.

20. A device for orthopedic restoration or tissue regeneration comprising a polyorthoester of Claim 1.

21. A bioerodible implant comprising a polyorthoester of Claim 1.

10 22. A pharmaceutical composition comprising:
 (a) an active agent; and
 (b) as a vehicle, the polyorthoester of Claim 1.

15 23. The pharmaceutical composition of Claim 22 where the fraction of the active agent is from 1% to 60% by weight of the composition.

24. The pharmaceutical composition of Claim 23 where the fraction of the active agent is from 5% to 30% by weight of the composition.

20 25. The pharmaceutical composition of Claim 22 where the active agent is selected from anti-infectives, antiseptics, steroids, therapeutic polypeptides, anti-inflammatory agents, cancer chemotherapeutic agents, narcotics, local anesthetics, antiangiogenic agents, vaccines, antigens, DNA, and antisense oligonucleotides.

25 26. The pharmaceutical composition of Claim 22 where the active agent is a therapeutic polypeptide.

27. The pharmaceutical composition of Claim 22 where the active agent is a local anesthetic.

28. The pharmaceutical composition of Claim 27 further comprising a glucocorticosteroid.

5 27. The pharmaceutical composition of Claim 22 where the active agent is an antiangiogenic agent.

30. The pharmaceutical composition of Claim 22 where the active agent is a cancer chemotherapeutic agent.

10

31. The pharmaceutical composition of Claim 22 where the active agent is an antibiotic.

32. The pharmaceutical composition of Claim 22 where the active agent is an anti-inflammatory agent.

15

33. A method of treating a disease state treatable by controlled release local administration of an active agent, comprising locally administering a therapeutically effective amount of the active agent in the form of a pharmaceutical composition of Claim 22.

20 34. The method of Claim 33 where the active agent is selected from anti-infectives, antiseptics, steroids, therapeutic polypeptides, anti-inflammatory agents, cancer chemotherapeutic agents, narcotics, local anesthetics, antiangiogenic agents, vaccines, antigens, DNA, and antisense oligonucleotides.

25 35. A method of preventing or relieving local pain at a site in a mammal, comprising administering to the site a therapeutically effective amount of a local anesthetic in the form of a pharmaceutically acceptable composition of Claim 22.